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Spatio-temporal changes in water demand of urban greenery

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Accurate estimation of evapotranspiration (ET) and water demand of urban green spaces (UGS) remain critical, especially in water-limited cities. Measuring ET helps decision□makers, urban planners and urban water managers formulate strategies and plans for sustainable green cities worldwide. In this study, we used three satellites, WorldView2, Landsat (OLI, TM5 and ETM+), and MODIS to measure the greenness and ET of a 780□ha public green space, the Adelaide Parklands in Australia. Different satellite□based vegetation indices (VIs) including the Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI) and Enhanced Vegetation Index 2 (EVI2) were assessed. The VI-based ET from these three satellites were estimated. We then validated these remote sensing-based ET with a field-based method of Soil Water Balance (SWB) using Artificial Neural Network (ANN). Inter□ and intra□annual changes of VIs and their relevant ET were mapped and analyzed during 2010-2018. Our study, using multi-sensor remote sensing data fusion, systematic methods and machine learning techniques confirmed the suitability and feasibility of remote sensing-based ET as accurate long□term monitoring mean for ET trends over large UGS. Our techniques rely on public and free-access satellite images, and therefore, can be adapted to other water-limited cities.